VEGETATION AND STRESS:
A COMPARISON STUDY OF VARYING AMOUNTS OF VEGETATION IN COUNTRYSIDE AND URBAN SCENES

by

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" . . . Nature matters to people. Big trees and small trees, glistening water, chirping birds, budding bushes, and colorful flowers - these are important ingredients in a good life. To have these available only rarely, when and if one can afford to leave the city, deprives people of tranquility and of spiritual sustenance" (Rachel Kaplan 1983, p.155).

CHAPTER I

INTRODUCTION

In today's busy world, people are continually exposed to environmental elements which are psychologically stressful. Accordingly, stress management has become a timely and extremely popular topic for discussion.

Research which examines the issue of environmental stress is currently of interest to many professionals. The study reported here, which looks at one aspect of environmental stress, should be of interest to urban designers, planners, architects, horticulturists, environmental psychologists and landscape architects.

HUMAN BEHAVIOR AND URBAN DESIGN

Considering criticism directed at urban designers today, professional attention to users' psychological responses to their environment would appear to be of great

importance (Wolfe 1981). Critics often accuse designers of actually "creating" stressful environments (Von Eckardt 1984). The connection between physical design and human behavior appears to have been ignored far too often. There are many contemporary examples of the failure of urban designers to recognize the importance of human behavior and psychological needs in relation to urban design. One much publicized example of urban design which dramatically failed to meet the needs of residents in several ways, including failure to address the natural environment, is St. Louis's ill-fated Pruitt-Igoe housing project (Newman 1972).

Studies which examine the relationship between human behavior and urban design will provide data which can be used to improve the quality of urban design. Hopefully, the development of an understanding of the relationship between human needs and various types of environmental components, ranging from man-made or "built" to naturally occurring or "natural" elements, will assist designers in making conscientious decisions which demonstrate sensitivity toward their clientele.

RELEVANCE OF RESEARCH TO THE DESIGN PROFESSION

The research reported here augments research studies which have previously been conducted within the fields of environmental behavior, psychology, sociology, architecture, horticultural therapy, landscape architecture, and urban planning. The results of this research are important to urban designers who are interested in increasing their sensitivity toward users and acquiring an understanding of the possible psychological effects a design may produce.

Results of psychological studies of stress and the urban environment can be used as a powerful tool for the landscape architect when communicating ideas to political officials, city commissioners, and other urban decision makers. Information resulting from reseach of this type lends support to designers' professional recommendations for the inclusion of vegetation in design projects. This knowledge supports the argument for including the landscape architect as a consultant to or as a member of the urban planning team.

RESEARCH SCOPE AND OBJECTIVES

The intention of this study is to examine and test the common assumption that features commonly found in the

natural environment alleviate human stress. For the purpose of this study a certain feature of nature, vegetation, is investigated. Specifically, the psychological impact or effect of vegetation as it relates to the urban environment is explored. The previously mentioned assumption is studied through the measurement of the psychological effects people experience by viewing photographic slides of the landscape containing varying amounts of green vegetation.

The main question addressed in this study follows:

"Are human stress levels influenced by the viewing of varying amounts of vegetation?"

Three secondary questions discussed in this study are:

1. What effect, if any, does the viewing of totally vegetated green COUNTRYSIDE landscape have on human stress levels;

2. How do these psychological effects compare with those produced by viewing URBAN scenes WITHOUT VEGETATION;

3. How do these psychological effects compare with those produced by viewing URBAN scenes WITH VEGETATION included?

OPERATIONAL DEFINITIONS

For the purpose of this paper the following terms are specifically defined:

1. Affect: Athough it is usually used in a much broader manner, this noun is used synonymously with the noun "emotion". (Pronounced af'fect.) *

2. Affect States: Emotional states that are often examined in this paper in terms of stress both psychological (emotional, feeling response) and physiological (physical, bodily reaction). *

3. Aesthetic Response: This term refers to preference or like/dislike affect in association with pleasurable feelings and neurophysiological (bodily response as it relates to the nervous system) activity elicited by visual encounter with an environment. *

4. Green Space: Planned/designed areas of vegetation which are located within a larger context otherwise devoid of vegetation such as parks, courtyards, planted plazas, boulevards of trees.

5. Natural Environment: That environment which is comprised of physical elements of natural rather than man-made origin.

6. Preference: Something for which one has a greater liking than for others, one's first choice. **

7. Perception: The awareness of one's surroundings accomplished through the medium of the senses. Participants in this study received information by perceiving slides visually. **

8. Stress: Strain or pressure that is exerted on human beings through interaction with their environment in which psychological reactions are the source of tension. Although it is difficult to totally separate physiological and psychological stress, this study focuses on psychological stress.

* Ulrich, Roger S. 1986.

** Webster's New World Dictionary of the American Language. 1962.

THESIS FORMAT

In Chapter II background information which is relevant to this study is reported. An historical perspective is given in order to establish an understanding of and appreciation for the issues addressed in the chapter. Research findings in the areas of landscape preference are reviewed, first in terms of aesthetics and secondly in terms of stress. Studies which examine the psychological and physiological affective response to vegetation in the landscape are discussed. Literature which specifically explores human response to vegetation as a part of the urban landscape is investigated.

Information presented in Chapter III includes an explanation of the research intent, the research hypotheses, and the research design. A detailed description of the experiment procedure, including slide selection and slide content, is given. Methods of statistical analysis which were used are also reviewed in this chapter.

The results of this study are presented in Chapter IV. Statistical analysis of the data is also described in this chapter.

Chapter V includes an evaluation of the study and an interpretation of results as they relate to the original research hypotheses. Future research possibilities and interests stimulated by this study will also be discussed in this chapter.

CHAPTER II

BACKGROUND

This chapter reviews past and current literature which supports the common assumption that the introduction of vegetation in urban areas is of psychological benefit to human beings.

HISTORICAL PERSPECTIVE

In general, the idea that exposure to nature has a calming effect on people has prevailed for centuries. From historical examples of art, poetry, and folklore the experience of nature appears to have long been considered an important source of inspiration. Landscape painters had a profound effect on the way Western people viewed the world. The landscape painters of Holland were the first artists to venture outside the planned environment and into the countryside for their subject matter (Jellicoe and Jellicoe 1975). Following in their footsteps, Italian and French landscape painters of the eighteenth century chronicled, in their artistic endeavors, the movement to the picturesque and romantic periods which glorified the natural landscape (Newton 1981). The public regard for and appreciation of landscape paintings reflect the

involvement people of that time had with the countryside and its natural character.

Qualities inherent in nature such as sunshine, clean air, natural bodies of water and green vegetation are generally considered to have a soothing effect on people. As early as the mid-1800's Frederick Law Olmsted, widely recognized as the "father of landscape architecture", strongly advocated the nature experience as an effective restorative measure good for the body, soul and mind (Olmsted 1865). Although a walk through the woods, a stroll through the park, or a drive through the countryside are common therapeutic prescriptions for the relief of stress, to date, few studies have been conducted to test the effectiveness of this prescription.

Current literature, however, suggests a resurgence of the humanistic "Olmstedian" ethic. Increased interest in and concern for the health, safety and general welfare of the public is represented in today's writings on urban design and planning. Jane Jacobs (1961) examines the decline in "quality of life" and "vitality" in an urban environment in her book The Death and Life of Great American Cities. Suggested approaches for revitalizing city life through diversity are presented by Jacobs in concert with leveling criticism at present and past urban

planning strategies. A conscientious approach toward providing a safe environment through urban design is thoroughly explored in Newman's (1972) book Defensible Space. In this book Newman " ... isolate(s) the factors affecting the behavior and attitudes of people ..." in order to formulate design guidelines for the promotion of healthy psychological and social personal development in federally funded low income public housing (p. xiii). Whyte (1980), in his book The Social Life of Small Urban Spaces, analyzes the successes and failures of small urban plazas in terms of social interaction and satisfaction. Design guidelines are given to facilitate urban designers in search of successful design solutions in terms of human social relationships.

RESEARCH STUDIES

Research studies which have been conducted within the fields of environmental behavior, psychology, sociology, architecture, horticultural therapy, landscape architecture, and urban planning are reported below. Information is presented in the following order:

* Landscape preference in terms of aesthetics
* Landscape preference in times of stress
* Psychological and physiological response to landscape
* Response to vegetation in the urban landscape

LANDSCAPE PREFERENCE IN TERMS OF AESTHETICS

The benefits of green space in urban design and the contribution vegetation makes to the aesthetic visual quality of the city landscape are widely recognized (Anderson and Schroeder 1983).

Many studies which report aesthetic preference in relation to the landscape (often examined through visual perception) have been published. For example, in one study participants were asked to rate slide photographs which were taken of landscapes in locations ranging from Alaska to Delaware as to personal preference. Results revealed that the participants preferred landscapes

similar to their home environments (Sonnenfeld 1969). Another study used slide photographs of landscape scenes taken in Grand Rapids, Michigan. Local participants were asked to rate each slide for familiarity, preference, and complexity, in that order. The researcher concluded that the familiar content of the urban landscape strongly influenced preference. Results showed that participants had the highest preference ratings for those landscapes with which they were most familiar (Herzog, S. Kaplan, R. Kaplan 1976).

A large amount of literature has appeared over the last fifteen years that focuses on experiments on aesthetic preference for natural landscapes. Through this work substantial progress has been made in identifying visual characteristics of natural landscapes that influence aesthetic preference or liking. Several approaches have been developed as a result of this research. The "psychological" approach attempts to relate preference and other emotions to psychologically relevent visual properties, such as complexity, that are present in widely different landscapes (Daniel and Vining 1983).

Several characteristics of high- and low-preference natural scenes are summarized in a psychological model

prepared by Roger Ulrich (1986). In terms of this model, preference or liking for "unspectacular" natural scenes should be comparatively high if:

1. complexity, or the number of independently perceived elements in the scene is moderate to high;

2. the complexity is structured to establish a focal point, and other order or patterning is also present;

3. there is a moderate to high level of depth that is clearly defined;

4. the ground surface has even or uniform length textures that are relatively smooth, and the observer judges that the surface is favorable to movement;

5. a deflected or curving sightline is present, conveying a sense that new landscape information lies immediately beyond the observer's visual bounds.

In addition to these characteristics, preference is often especially high when a water feature is present (Brush and Shafer 1975, Zube et al. 1975, Penning-Rowsell 1979). Several other studies have indicated that high-preference views can frequently be described as park-like or savanna-like in appearance (Rabinowitz and Coughlin 1970, Ulrich 1973, Balling and Falk 1982). In general,

landscapes which contain smooth ground covers, natural water features, scattered trees and depth or openness, such as urban parks, constitute a class of natural landscapes that are highly preferred over many other natural scenes (Ulrich 1986).

Other studies have shown that there is a strong tendency for people to prefer natural landscape scenes over urban views, especially when the urban scenes lack vegetation or water features. It has often been reported that even mediocre natural views consistently elicit higher aesthetic preference ratios than do all except a very small percentage of urban scenes (Kaplan et al. 1972, Zube et al. 1975, Wohlwill 1976, Palmer 1978).

Apart from eliciting different patterns of aesthetic preference, there is abundant evidence that natural versus built properties are important in influencing perception and categorization of outdoor environments. Several studies have shown that individuals respond in fundamentally different ways to natural and man-made material. In general, groups tend to categorize views as "natural" if the landscape content is predominantly vegetation and/or water, and if man-made features such as buildings and cars are absent or inconspicuous. It has been argued that elements of nature fall within a

"natural" psychological category, and that individuals readily discriminate nature from man-made environments because of particular stimulus characteristics such as curvilinear contours and continuous gradations of shape and color (Wohlwill 1983).

Several researchers have found that the presence of man-made features in natural settings can have strong negative effects on liking (Stainbrook 1968, Driver and Greene 1977, Ulrich 1983). Certain man-made features such as utility poles and power lines, appear to reduce attractiveness to a greater extent than other types of built environments (Brush and Palmer 1979). Human intrusion in the form of visible air pollution and reduced visual range appears to lower scenic beauty rating for some vistas but may not lower liking for many other natural landscapes (Latimer et al. 1981). Urban sounds heard in natural settings have been found to have strong negative effects on observers' preferences (Anderson et al. 1983).

Landscape preference studies like those described above furnish information relative to the study reported here. It is important to note that preferred landscapes may reduce stress. Although the issue of preference is

not specifically or directly measured in this study, the indirect impact that preference has on one's perception of the landscape must be recognized. Landscape preference also influences one's psychological response to the landscape. Visual quality, familiarity with certain environmental settings, "natural" landscape properties, complexity of scenery, and other landscape characteristics which affect one's attitude toward the landscape may have a direct bearing on the results of this study. Information found in studies examining preference for natural environment compared to urban environment and the psychological effects of man-made elements in the natural environment is particularly applicable to this study. In order to establish validity for conclusions drawn in this study, landscape preference findings must be taken into account.

LANDSCAPE PREFERENCE IN TIMES OF STRESS

The assumption examined in this paper which suggests that the natural environment is stress reducing is far from new. From the beginning of time, people have been heavily influenced by nature. The bond between the human race and nature was born of necessity. People were dependent upon nature for food, shelter, and water. In order to survive it was critical to know a great deal

about the environment (Washburn 1978). Procuring food required people to traverse large expanses of land and to be able to find their way back. When in danger people had to be able to diagnose the problem quickly and take appropriate action immediately. All of these early survival techniques required acute sensory awareness with particular emphasis on visual perception (Campbell 1978). At the present time the important link between the natural environment and visual perception prevails in less dangerous, but, perhaps more stressful conditions. Today, in times of chronic stress, many people revert to their ancestral heritage and return to nature for solace (Napier 1983).

It has been suggested that the introduction of the natural element of vegetation into urban space actually improves one's "sense of place" and, thereby, eases stress (Steele 1981). People suffer a definite "psychic cost" in the exposure to aversive events through adaptation to environmental stress (Glass and Singer 1973). Rachel Kaplan (1984) contends that the "natural" urban environment can provide the setting for human recovery from the stresses and strains of city life.

> " . . . Trees and flowers, landscaped areas, and even very small parks that humans attend to effortlessly provide opportunities for mind-filling moments. They provide patterns that humans attend to effortlessly and, in the process, they permit moments of recovery from the strains of the day" (R.Kaplan 1983, p.196).

As a partial solution to stress caused by today's urbanized environment some researchers have advocated the use of plants to reduce levels of stress (Gold 1977, Iltis 1973).

In one of his early research efforts, Roger Ulrich (1979) studied the effect of visual landscapes on human psychological well-being in terms of stress levels. As the research reported here is a near replication of this study, the findings are particular noteworthy. The experiment consisted of showing colored slides to two groups of mildly stressed college students. To insure that the participants would be experiencing a similar level of stress, as well as involved in a similar activity for an identical amount of time prior to viewing the slides, the slide presentations were given immediately following completion of a departmental hour examination. One group viewed fifty slides of nature scenes displaying an abundance of green vegetation. The other group viewed fifty slides of urban scenes devoid of natural elements,

specifically vegetation. Prior to and following the slide presentations participants were asked to take a brief stress test to determine their psychological states before and after viewing the slides. The original hypothesis prior to data collection was that the anxiety levels of both groups would decline during the presentations. It was also assumed that the group shown nature scenes would report lower post-slide scores than the group shown urban scenes. As predicted, the data analysis proved the hypothesis true. In addition, the outcome showed the levels of stress were actually elevated in the group which viewed the urban scenes.

Human preference for the natural environment in times of stress has been studied often. Studies which examine landscape preference indicate that preference has a strong influence on a person's psychological response to the environment. It has been suggested that deviation from one's preferred environmental setting can actually produce stress. In fact, some of the most stressful conditions have been found to occur in situations where environments run counter to human preferences (R. Kaplan 1977b).

These examples illustrate the evolution of man's close relationship with and perception of the landscape

with regard to stress. Information of this type contributes to an increased awareness of the research topic examined and reported in this paper. Past attitudes and human responses to environmental elements may have direct bearing on the outcome of this research project. The influence of one's environmental preference upon levels of stress is equally important. Research which examines the psychological effects of presence or absence of vegetation in the landscape has been particularly valuable and instructive in the development of this project.

PSYCHOLOGICAL AND PHYSIOLOGICAL RESPONSE TO LANDSCAPE

A study by Rachel Kaplan (1977a) related nature to psychological well-being. In this study the Environmental Preference Questionnaire (E.P.Q.) was used to explore individual differences in environmental preference. Kaplan concluded that contact with nature increases one's self-confidence and self-esteem. It stands to reason that an increase in self-confidence and self-esteem results in an increased state of relaxation thereby creating a reduction of stress. Studies which report increased self-esteem as a consequence of contact with nature offer information which relates to this study.

Kaplan (1973) used the activity of gardening in another study as a context in which to study the psychological benefits of nature. Data were collected from two major groups of gardeners: community gardeners and home gardeners. The participants were interviewed and asked to complete a questionnaire which contained three areas of questioning: primary garden benefits, such as working in the soil, watching plants grow and being outdoors; sustained interest scale, such as the ability of the gardening activity to sustain one's level of interest, provide the opportunity to relax and create a sense of accomplishment; and tangible benefits, such as cutting food expenses, harvesting, producing and consuming homegrown food. Analysis of the participants' responses showed that the benefits most often chosen were in the sustained interest category. Tangible benefits rated the lowest of the three categories. The categories of primary garden benefits and sustained interest contained primarily psychological benefits. As a result Kaplan concluded that the participants derived considerable psychological benefit from their experience with nature. The content of the three categories of gardening benefits as presented in the questionnaire are listed in Figure 2.1.

Figure 2.1: Garden Benefit Categories

CATEGORIES	QUESTION TOPICS
Sustained Interest Scale:	
	ability to sustain interest
	valuable way to spend time
	diversion from routine
	aesthetic pleasure from plants
	provide opportunity to relax
	create sense of accomplishment
Primary Garden Experiences:	
	desire to work in soil
	wish to see things grow
	like being outside
	are interested in learning about gardening
Tangible Benefits:	
	enjoy the feeling of producing some of my own food
	cut food expenses
	harvesting

Note: Adapted from Kaplan, Rachel 1973

The positive benefits achieved through the gardening experience within an urban context were recognized in another study. The success of several urban gardening programs was reported in this article. Involvement in community gardening was found, in all instances, to be psychologically beneficial to participants involved.

Elevation of the self-esteem of participants was reported as a specific benefit (Lewis 1979).

Another research project examined the self-esteem of participants. This study involved the application of horticultural therapy in a geriatric setting. The purpose of this research was to measure change in the individuals' life satisfaction levels. Specifically, the self-esteem levels of people in an institutional setting were examined. Residents of a care home for the elderly were divided into three groups: gardening, discussion and control. Life satisfaction levels of each group were tested at the beginning of the project and, eight weeks later, at the project's end. The gardening group was active in choosing plant materials, preparing a planting plan, preparing the soil, and planting and maintaining a 15' by 30' garden plot. The discussion group was set up to meet twice a week for an hour. Topics ranged from the pros and cons of pets to the latest grandchild or family problem. The control group was not involved in any particular activity during the eight week period, but completed both pre-test and post-test with the other two groups. Results showed that the gardening group participants maintained the level of satisfaction and self-esteem that they displayed at the beginning of the

project, but the other two groups showed a significant decline. It has been reported that levels of self-esteem of typical geriatric patients characteristically decline greatly within the first six weeks of residency in a care facility. Because maintaining geriatric residents' self-esteem is an important goal of the geriatric therapist, the inclusion of horticultural activities in care home schedules may prove to be of considerable psychological benefit to home residents (Train 1974).

Roger Ulrich has conducted numerous studies concerning the psychological impact of nature in an urban setting. In one of Ulrich's studies participants viewed sixty color slides of either (1) natural settings with water, (2) natural settings dominated by vegetation, or (3) urban environments without water or vegetation. The information rates of the three slide samples were equivalent. Measurements were taken of the effects of the slide presentations on alpha amplitude, heart rate and emotional states. Alpha amplitude is a measurement of brain electrical activity by means of an electroencephalograph (EEG) apparatus. High levels of alpha amplitude indicate low levels of physiological arousal as well as relaxation. Analysis of data revealed several significant differences as a function of

environment which together indicated that the two categories of nature views had more positive influences on psychophysical states than the urban scenes. Alpha was significantly higher during the viewing of vegetation slides as opposed to urban slides. Similarly, alpha was higher on the average when participants viewed slides with water content rather than urban content. There was also a consistent pattern for nature scenes to have more positive influences on emotional states. A salient finding was that views of nature held attention and interest more effectively than the urban scenes (Ulrich 1981).

Ulrich (1984b) conducted another study in which surgical patients' recovery records, compiled over an eight year period, were examined to determine whether assignment to a room with a window view of a natural setting might have restorative influences. The patients were recovering from identical surgery, cholecystectomy. The records of twenty-three patients assigned to rooms with windows looking out on a natural scene containing vegetation were compared with those of twenty-three patients assigned to similar rooms with windows facing a brick building wall. Conclusions of the study revealed that the patients who viewed the natural scene had shorter post-operative hospital stays, received fewer negative

evaluative comments in nurses' notes, and took fewer potent analgesics than the patients with the view of the wall.

In a recent study Ulrich (1984a) further substantiated the widespread belief that plants generally make people feel better. Ulrich interviewed Ann Arbor, Michigan, shoppers whose home locations gave them a choice between driving to a shopping center on an interstate highway, or taking a longer route via a more scenic, well-landscaped parkway. The shoppers chose the parkway for slightly more than half their trips, despite its greater driving time. The shoppers reported the greatest influence towards their choice was the opportunity of experiencing the parkway's natural beauty.

Review of research studies which examine psychological and physiological affective response to landscape presents information which is especially appropriate to the research topic developed in this paper. It is important to note those studies which indicate one's emotional, or "feeling", response to the landscape. The degree to which exposure to natural elements, in particular the natural element of vegetation, increases one's self-esteem and self-confidence is indicative of

their effect on psychological well-being. Results of research studies that examine the benefits of natural elements in an urban context provide support for the hypotheses of this research project. Studies which demonstrate dramatic positive physiological and psychological recovery rates which correlate with increased exposure to natural elements found in the landscape are especially supportive of the research reported here.

RESPONSE TO VEGETATION IN URBAN LANDSCAPE

A large body of anecdotal, historical and research evidence indicates that most city dwellers attach considerable importance to urban forests and parks, and the views of trees, grass and open space provided by such settings. These are all judged to be very important environmental amenities (Driver et al. 1978, R. Kaplan 1983).

Recent literature examining aesthetic preferences for urban scenes with and without vegetation has consistently reported that the presence of vegetation, especially trees, has positive effects on preference. Lynch and Rivkin (1958) found that a sample of pedestrians universally responded in a very positive, pleasurable

manner to vegetation. In their study A Walk Around the Block, they reported that vegetation, specifically trees, played a significant role in participants' positive responses while on a walking tour of downtown Boston. The element of vegetation rated second only to urban open spaces for eliciting the most favorable reactions.

Thayer and Atwood (1978) compared scenes that were similar except for the presence or absence of vegetation, and reported that the presence of plants usually increased ratings significantly. Ulrich and Addoms (1981) found that residents of a high-density housing complex rated urban settings far higher in preference when they contained prominent amounts of vegetation, and when buildings were at greater distances from the observer.

Studies which provide evidence indicating that vegetation is considered an important environmental amenity to the urban dweller provide considerable support for the hypotheses presented in this paper.

DISCUSSION

Upon review of the articles, reports and research cited in this paper one may conclude that information concerning possible psychological benefits to the public of urban vegetation may provide urban designers with yet

another valuable field of study for data to support the argument for city vegetation. This information may be helpful in persuading political officials and other influential urban decision makers to include plant material in on-going design. Data of this type may also be of help to urban designers to support the placement of trees into established areas lacking in vegetation. In any event, information of the type reported here should be of considerable value to urban designers.

In fact, thoughtful consideration of any possible psychological impact, good or bad, a designed space may have on citizens is not only basic information but a moral and professional responsibility of all professionals involved in urban design.

CHAPTER III

METHODOLOGY

RESEARCH INTENT

The purpose of this research project is to examine and test the common assumption that the visual perception of:

"FEATURES INHERENT IN THE NATURAL ENVIRONMENT ALLEVIATE STRESS."

In this study the effects of one specific natural feature, VEGETATION, and its relationship to the URBAN ENVIRONMENT is explored. The assumption is examined through the measurement of psychological effects people experience through the visual perception of varying amounts of vegetation.

RESEARCH HYPOTHESES

This study addresses four central questions:

1. Are human stress levels influenced by the viewing of varying amounts of vegetation?

2. What effect, if any, does the viewing of totally green, vegetated COUNTRYSIDE landscape have on human stress levels?

3. How do the psychological effects of viewing COUNTRYSIDE landscape compare with those produced by viewing URBAN scenes WITHOUT VEGETATION?

4. How do the psychological effects of viewing COUNTRYSIDE landscape and the psychological effects of viewing URBAN scenes WITHOUT VEGETATION compare with those psychological effects produced by viewing URBAN scenes WITH VEGETATION?

The main hypothesis of this study is that:

HUMAN STRESS LEVELS ARE INFLUENCED BY THE VIEWING OF VARYING AMOUNTS OF VEGETATION

Prior to data collection and analysis it was assumed that after the slide presentations:

1. The stress levels of participants in groups that viewed slides containing vegetation, both COUNTRYSIDE and URBAN WITH VEGETATION, would be somewhat lowered;

2. The stress levels of participants in the group that viewed the larger amount of vegetation, COUNTRYSIDE, would decline more significantly than stress levels in the group that viewed the smaller amount of vegetation, URBAN WITH VEGETATION;

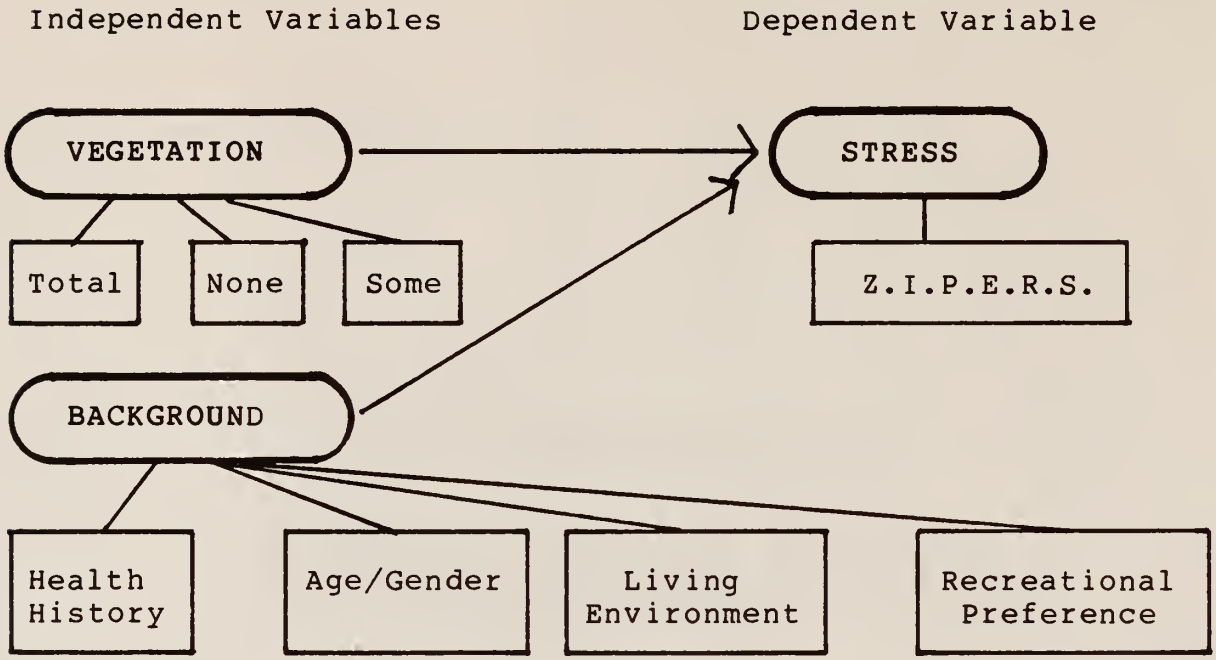
3. The stress levels of participants in the group that viewed the scenes of URBAN WITHOUT VEGETATION would remain the same or be elevated.

RESEARCH DESIGN

The research design used in this study involved the measurement of constructs. A construct is defined as an idea or image resulting from an arrangement of facts and impressions (Campbell and Stanley 1963). Constructs in this study are the concepts of "vegetation" (independent variable) and "stress" (dependent variable).

The effect of the visual perception of varying amounts of green vegetation on human stress levels is the central focus of this research study. By using pre- and post-tests of stress to gather data on stress levels and a demographic questionnaire to collect background information, quantitative analysis can be done which shows identifiable links between constructs. These links and measurements are illustrated in graphic form (Figure 3.1).

Figure 3.1: Research Design



EXPERIMENT PROCEDURE

The basic experiment procedure of this research project involved showing colored slides of outdoor environments to three groups of participants. Color photography was used as a surrogate for the actual landscape. Color photography was chosen because human response to color photographs relates more closely with field responses than to black and white photographs (Shuttleworth 1980). This method of landscape representation is generally accepted for use in landscape

studies (Zube et al. 1974, R. Kaplan 1977, Ulrich 1979, and Daniel and Boster 1976).

A total of 213 participants was obtained from general survey undergraduate classes offered by the chemistry, mathematics, architecture and biology departments at Kansas State University. The course content of the classes was general and elective subject matter as opposed to specific degree-oriented subject matter. Due to this fact, the participants displayed a variety of backgrounds, interests and experiences.

For each experiment session the participants were divided into three groups of nearly equal size: COUNTRYSIDE, URBAN WITHOUT VEGETATION, URBAN WITH VEGETATION. The COUNTRYSIDE group was shown slides of green, vegetated countryside. The scenes consisted of prairie pastureland and tallgrass prairie typical of the northeastern Kansas Flint Hills region. Cultivated farmland was included in several of the slides. The URBAN WITHOUT VEGETATION group viewed slides urban scenes without vegetation. The urban slides were taken in a variety of cities located throughout the United States. The cities photographed ranged in size from Philadelphia, Pennsylvania, to Manhattan, Kansas. The URBAN WITH

VEGETATION group viewed slides showing urban scenes with vegetation introduced. Content of these slides varied from designed plazas to street tree plantings.

In every instance the slide presentations were given immediately following hour examinations. The hour examination setting was chosen with the assumption the students would be experiencing a measureable amount of stress due to the testing situation. In addition to the stressful nature of the examination, the participants were involved in a similar activity for a similar amount of time prior to the experiment sessions.

Immediately following their dismissal from the hour examinations the participants were escorted to three separate rooms located in the vicinity and instructed to begin the experiment sessions. Instructions included a brief statement of informed consent and details concerning the procedure of the experiment session. The statement of informed consent is shown in Appendix A.

Following the introductory statements the participants were instructed to complete a reliable stress test in order to measure their "affect states" or feelings at that moment. The test was the Zuckerman Inventory of Personal Reactions (ZIPERS) (Zuckerman 1977).

ZIPERS is a ten question, broad-affect test which measures an individual's emotions and anxiety state at the time it is administered. This test assesses feeling on five factors: fear arousal, positive affect, anger/aggression, attentiveness/coping and sadness. The participant responds by indicating on a five-point scale the degree of feeling he/she is experiencing at that moment. Examples of the items are: "I feel carefree or playful", "I feel affectionate or warmhearted", "I feel elated or pleased", "I feel sad", and "I feel angry or defiant". The ZIPERS form used appears in Appendix B.

Following the stress test the three slide presentations were given in three rooms with identical surroundings and similarly controlled lighting conditions. Windows were covered with black-out shades during daytime presentations. Procedure for all slide presentations was identical. The projectors were placed at the same distance from the projector screens and the participants were seated at the same distance from the screens. The participants were asked to view the slides attentively. No test or questionnaire was administered during the slide presentation.

SLIDE SELECTION / SLIDE CONTENT

A total of thirty-five slides was shown to each group. All slides were taken during the month of May and June to insure a dominance of green vegetation in the countryside scenes and similar green conditions in the urban scenes. Photographs were taken in a horizontal format. The horizontal format was chosen because it is more compatible with the dominant compositional orientation of the three types of landscape scenes photographed for this study (Nassauer 1983). A 35 mm camera equipped with a 28 mm wide-angle lens was used for all photography. This wide-angle lens was chosen because it produces a photographic image near that which would be perceived naturally by the human eyes. Shuttleworth (1981) recommends use of a wide-angle lens in order to

> " . . . provide the lateral and foreground context in each of the views without apparent distortion of the actual scale relationships that are found in the direct perception of landscape".

Care was taken to photograph all scenes under similar lighting conditions. All slides were taken at human eye level. Sky appearance was the same in all photographs. Composition of the photographs was not particularly emphasized. No animals or people were included in the

photographs. In order to avoid any possible bias, no living organisms other than vegetation were visible in any photographs. The urban scenes excluded churches, funeral parlors, residential areas, police stations, fire stations, and hospitals to eliminate any bias that might occur due to possible emotional association with these building types (Ulrich 1979). The content of the urban scenes was of "built structures" with and without planned/designed green space. Examples of actual slides used are included in Appendix C.

The final 105 slides chosen for inclusion in the presentations were selected from a pool of 225 slides. Slides were selected with the guidance of a researcher well-versed and experienced in similar slide selection procedures. Initial selection was based on photographic quality. Slides with consistent degrees of exposure, best resolution and sharpest clarity were chosen. Care was taken to select photographs which displayed similar levels of complexity. The level of information contained in the scenes was similar for all slides. Selection was guided with an attempt to represent a range of photographs within each context category. Other criteria for selection included elimination of slides which displayed a predominance (40 - 60%) of sky, scenes which elicited

feelings of a foreboding or hazardous nature and those slides containing objects or elements which might produce bias in the viewer's perception.

The slides were shown at approximately 9 to 10 second intervals. This period of time was of ample length to allow unhurried perception, but at the same time not be so long as to cause the participants' attention to drift. At 9 to 10 second intervals the entire slide presentation took ranged from 5.2 to 5.8 minutes each. Slide presentation specifics are shown in Figure 3.2.

Figure 3.2: Slide Presentation Specifics

Total Number of Participants = 213

Countryside Group = 72
Urban with Vegetation Group = 71
Urban without Vegetation Group = 70

Total Number of Slides = 105

Countryside Group = 35
Urban with Vegetation Group = 35
Urban without Vegetation Group = 35

Total Length of Slide Presentation With Slides Shown at 9-10 Second Intervals = 5.2-5.8 Min.

Upon completion of the slide presentations the participants were asked to complete a second stress test

identical to the first ZIPERS test given. Following the second ZIPERS test the participants were asked to complete a questionnaire containing 10 questions requesting demographic information such as age, gender and the type of environment they have lived in for the majority of their lives (rural area, small town, suburb or urban). The questionnaire also included questions concerning recreational preference, family occupations and personal health history. These demographic data were taken into account when the stress test data were analyzed. The demographic questionnaire which was used appears in Appendix D.

The rooms in which the slide presentations were given were identical. Timing for all slide presentations was synchronized. Demographic data were taken into account. Thus, the only difference in the participants' experience was in the variation of slide content. Due to these controls, it is hoped that differences in stress levels of the three groups during the assessment can be attributed to the varying amounts of green vegetation viewed.

STATISTICAL ANALYSES

Data collected during these experiment sessions were sorted, analyzed, and compared to furnish information to

test the hypotheses. All data were coded and entered into the Harris system used by the Kansas State University Statistics Department. The SAS (Statistical Analysis System) was the statistical program used. These systems were used to calculate the following:

1. The mean and standard deviation values of the five ZIPERS response factors (fear, anger, sadness, positive affect and attention) before and after the slide presentations listed in the three group categories (countryside, urban devoid of vegetation and urban with vegetation).

2. The difference between the ZIPERS pre- and post-test scores in the five variable affect response factors with a probability of $p < .05$ set as the level of significance.

3. Tables examining each demographic questionnaire variable listed with averages and number of observations for the various demographic variables by group.

CHAPTER IV

RESULTS

The results of this research study have been organized into five sections. Preliminary operational adjustments are described in the first section. The pre-slide affect level scores for the three groups of participants are examined in the second section. In the third section the mean scores and standard deviations for the five affect factors for both pre- and post- ZIPERS tests are presented according to the three groups of participants. The fourth section describes differences in terms of probability values found between the pre- and post- ZIPERS tests in each of the five affect factors. Significant differences are discussed in this section. The background variables collected from the demographic questionnaire are reported in the fifth section.

PRELIMINARY OPERATIONAL ADJUSTMENTS

After entering the raw data into the Harris system and prior to actual data manipulation the ten ZIPERS items were grouped according to each of the five corresponding affect factors. This was done in order to simplify data analysis. The groups are shown in Figure 4.1.

Figure 4.1: Groups of ZIPERS Items According to Affect Factor

Affect Factor	ZIPERS Items
Fear	Feel fearful
Sadness	Feel sad
Positive Affect	Feel carefree or playful Feel affectionate or warmhearted Feel elated or pleased Feel like acting friendly
Attentiveness	Feel attentive or concentrating
Anger	Feel angry or defiant Feel like telling off someone Feel like getting out of this situation or avoiding it

PRE-SLIDE AFFECT STATE SCORES

The first series of statistical tests identified no statistically significant differences between the groups' scores for the ZIPERS items prior to viewing the slides. These results indicate that affect levels, or feelings and moods, were similar across groups prior to the slide presentations. The mean values for the pre-slide ZIPERS scores (Table 4.1) suggest that anxiety levels had been somewhat elevated by the examinations given prior to the experiment sessions.

Table 4.1: Affect Scores Before Slide Presentations

Affect Factor	Mean Score
COUNTRYSIDE GROUP	
Fear	1.15
Anger	1.72
Sadness	1.36
Positive Affect	3.10
Attentiveness	2.55
URBAN GROUP	
Fear	1.20
Anger	1.58
Sadness	1.50
Positive Affect	3.13
Attentiveness	2.83
URBAN WITH VEGETATION GROUP	
Fear	1.35
Anger	1.60
Sadness	1.49
Positive Affect	3.27
Attentiveness	2.74

ZIPERS MEAN SCORES AND STANDARD DEVIATIONS

As the first step in analyzing the effects of the slide presentations, each group's post-slide ZIPERS scores were compared with the group's scores at the beginning of the experiment. Results are shown in Table 4.2.

Table 4.2: Affect Scores Before & After Slide Presentations

Affect Factor	Mean Score		Standard Deviation	
COUNTRYSIDE	Before	After	Before	After
Fear	1.15	1.04	0.40	0.20
Anger	1.72	1.58	0.79	0.78
Sadness	1.36	1.39	0.71	0.74
Positive Affect	3.10	3.22	1.08	1.05
Attentiveness	2.55	2.36	1.07	1.13
URBAN	Before	After	Before	After
Fear	1.20	1.13	0.60	0.54
Anger	1.58	1.61	0.73	0.80
Sadness	1.50	1.63	0.92	1.04
Positive Affect	3.13	2.65	0.93	0.86
Attentiveness	2.83	2.66	1.12	1.08
URBAN WITH VEGETATION	Before	After	Before	After
Fear	1.35	1.18	0.70	0.46
Anger	1.60	1.45	0.76	0.62
Sadness	1.49	1.44	0.84	0.65
Positive Affect	3.27	3.30	0.81	1.00
Attentiveness	2.74	2.85	1.22	1.28

The mean scores for the affect factors before and after the slide presentations are an indication of either reduction or elevation of levels of stress. The affective factors of fear, anger, and sadness, due to their negative emotional quality, are considered to have a negative impact on stress levels. Accordingly, lower mean scores for these three factors indicate stress reduction while raised mean scores indicate the elevation of stress. Conversely, the affect factors of positive affect and attentiveness are considered to have a positive impact on stress levels; therefore, raised mean scores indicate a reduction of stress and lowered mean scores are indicative of the elevation of stress.

The mean scores in the affect factor of fear were lowered after the slide presentations in all three groups, denoting stress reduction. In the case of the affect factor of anger, mean scores were lowered in the countryside group and the urban with vegetation group. Mean scores for the factor of fear were raised in the urban without vegetation group. Mean scores for the factor of sadness were raised in the countryside and urban without vegetation groups while they were lowered in the urban with vegetation group.

The most dramatic change in mean scores before and after slide presentation appeared in the results of the positive affect factor. While mean scores for positive affect were raised in both countryside and urban with vegetation groups they were lowered considerably (Ø.48) in the urban without vegetation group. Mean scores for the affect factor of attention were lowered in the countryside and urban without vegetation group while they were raised in the urban with vegetation group.

DIFFERENCES BETWEEN PRE- AND POST- ZIPERS TESTS

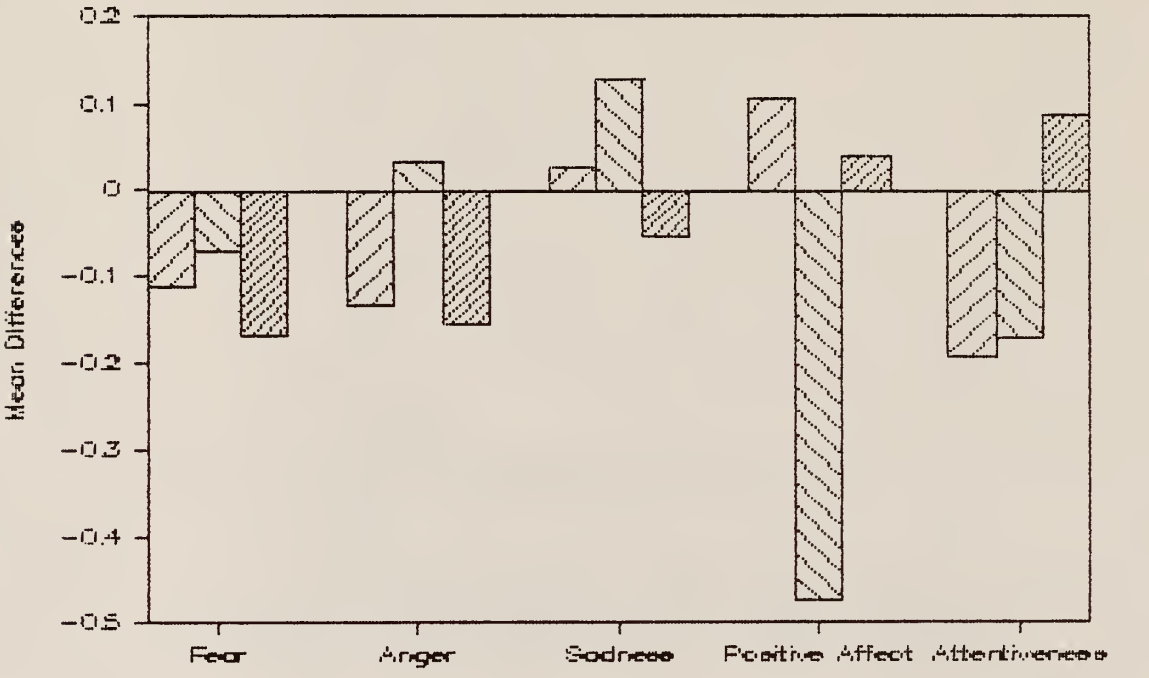
A series of t-tests were used in these within-group comparisons to identify significant differences. Results of the t-tests revealed significant differences in the participants' responses to the ZIPERS questions in four of the affect factors. The starred values that are shown in Table 4.3 indicate that the emotion, or affect state, is significantly different after the slide presentations than before. The graph presented in Figure 4.2 represents the mean differences shown in Table 4.3.

Table 4.3: Differences in Affect Scores Before & After Slide Presentations

Affect Factor	Mean Difference	P-Value
COUNTRYSIDE GROUP		
Fear	-0.111	0.0039 ***
Anger	-0.134	0.0903
Sadness	0.028	0.6406
Positive Affect	0.106	0.1454
Attentiveness	-0.194	0.1366
URBAN GROUP		
Fear	-0.071	0.1989
Anger	0.033	0.6064
Sadness	0.129	0.2007
Positive Affect	-0.475	0.0001 ***
Attentiveness	-0.171	0.1529
URBAN WITH VEGETATION GROUP		
Fear	-0.169	0.0039 ***
Anger	-0.155	0.0083 ***
Sadness	-0.056	0.5088
Positive Affect	0.039	0.5817
Attentiveness	0.086	0.4894

*** = Significant Difference - Probability .05 or less

Figure 4.2: Mean Differences



Countryside Group Urban Group Urban with Vegetation

All computations were scored for:

AFTER slides minus BEFORE slides

A - B = Mean Difference

Therefore, if the resulting value is negative the intensity of the emotion has been reduced. Results concluded that after the slide presentations the affect factor of:

1. **FEAR** was significantly **REDUCED** in the COUNTRYSIDE group;

2. **FEAR** was significantly **REDUCED** in the URBAN WITH VEGETATION group;

3. **ANGER** was significantly **REDUCED** in the URBAN WITH VEGETATION group;

4. **POSITIVE AFFECT** was significantly **REDUCED** in the URBAN WITHOUT VEGETATION group.

BACKGROUND VARIABLES AND AFFECT STATE SCORES

The fourth phase of the analysis tested whether the participants' affect states and affect changes differed as a function of 1) sex, 2) age, 3) academic classification, 4) the type of environment in which they had lived the majority of their lives, 5) the type of environment in which they would currently prefer to live, 6) personal history of stress-related health problems, and 7) family history of stress-related health problems. Tests revealed no significant differences in affect states or affect changes as a function of any of the seven background variables. Responses to the question on recreational preference were not analyzed because of the complex diversity of answers.

Analysis of the background variables of age and academic classification showed totals in keeping with the evenly balanced composition and distribution of participants which was originally desired and anticipated. Ages range from 18 to 43 years of age with an overwhelming majority falling into the 18 to 24 year range with only 22 of the 213 participants over the age of 24 (Table 4.4).

Table 4.4: Groups by Age

AGE	18	19	20	21	22	23	24	25 to 43
C	7	22	17	7	6	2	2	9
U	13	23	11	5	5	4	3	5
V	7	26	9	5	5	5	3	8
TOTAL	27	71	36	17	16	11	8	22

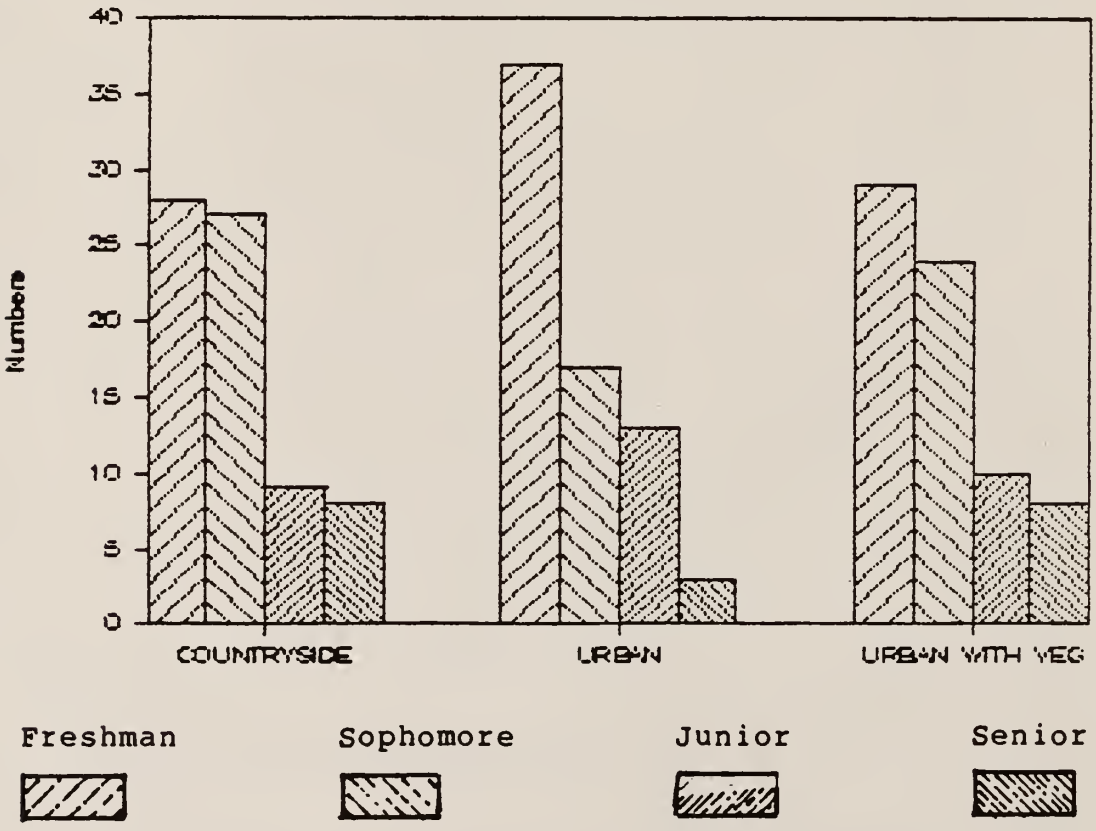
C = COUNTRYSIDE
U = URBAN WITHOUT VEGETATION
V = URBAN WITH VEGETATION

Likewise, the composition of groups as it related to academic classification was found, as expected, to be predominantly composed of entry level students, including freshmen (n = 94), sophomores (n = 68), juniors (n = 32) and seniors (n = 19). Totals for the individual groups are shown in Table 4.5. Figure 4.3 graphically represents the figures in Table 4.5.

Table 4.5: Group by Academic Classification

Group	Freshman	Sophomore	Junior	Senior
COUNTRYSIDE	28	27	9	8
URBAN	37	17	13	3
URBAN WITH VEGETATION	29	24	10	8
TOTAL	94	68	32	19

Figure 4.3: Group by Academic Classification

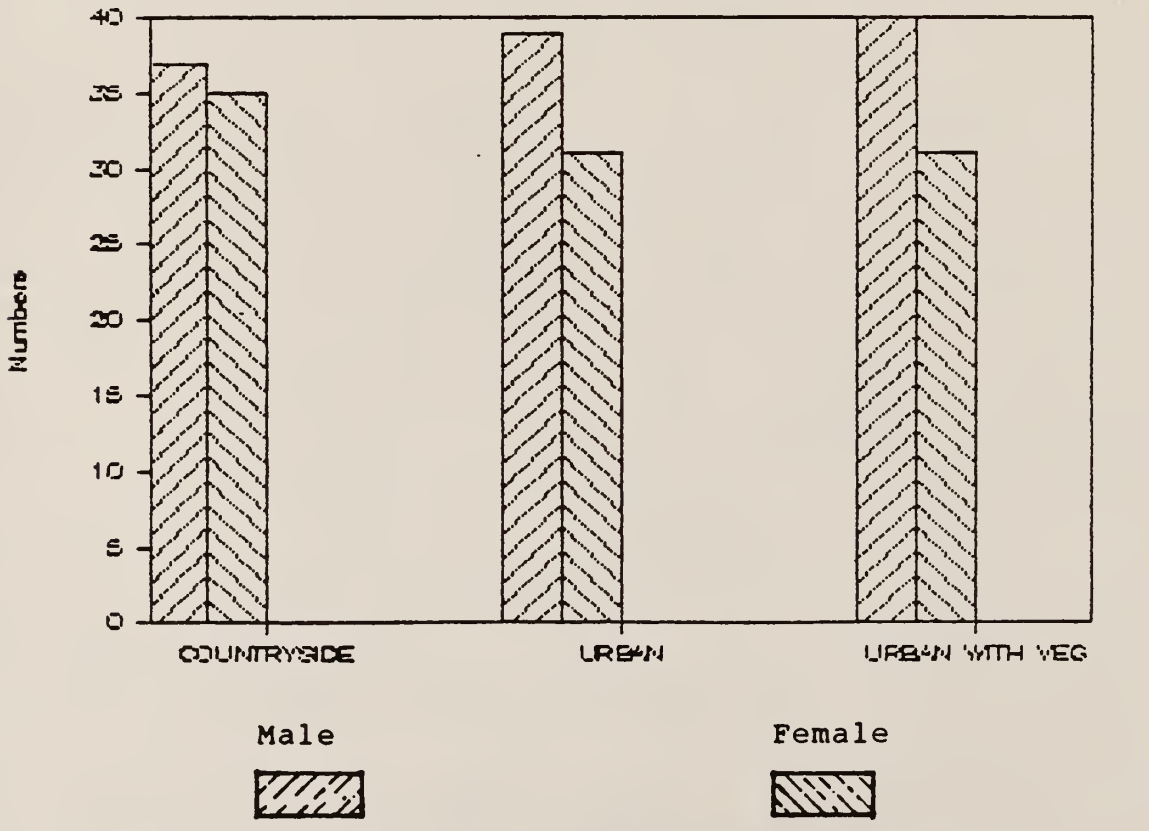


The groups shown countryside scenes included 37 males and 35 females; the groups shown urban scenes with vegetation was comprised of 40 males and 31 females; the groups shown urban scenes without vegetation contained 39 males and 31 females (Table 4.6). Figure 4.4 shows a graphic representation of the figures in Table 4.6.

Table 4.6: Group by Sex

	Male	Female	Total
COUNTRYSIDE	37	35	72
URBAN	39	31	70
URBAN WITH VEGETATION	40	31	71
TOTALS	116	97	213

Figure 4.4: Group by Sex



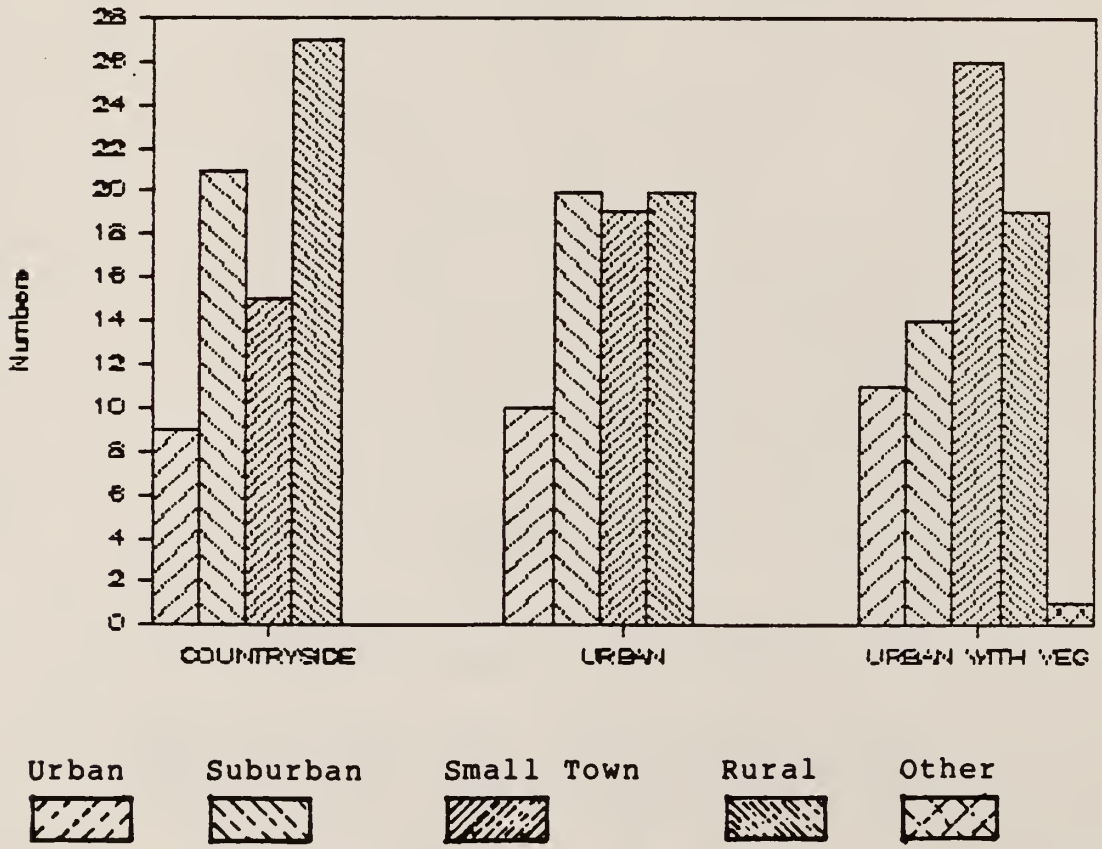
The groups were also stratified on the basis of whether they had grown up in an urban area (n = 30), suburban area (n = 55), small town (n = 60), or rural area (n = 66). These figures appear in Table 4.7. Figure 4.5 graphically represents the figures in Table 4.7.

Table 4.7: Group by Setting

Group	Urban	Suburban	Small Town	Rural	Other
C	9	21	15	27	Ø
U	1Ø	2Ø	19	2Ø	Ø
V	11	14	26	19	1
TOTAL	3Ø	55	6Ø	66	1

C = COUNTRYSIDE
U = URBAN WITHOUT VEGETATION
V = URBAN WITH VEGETATION

Figure 4.5: Group by Setting

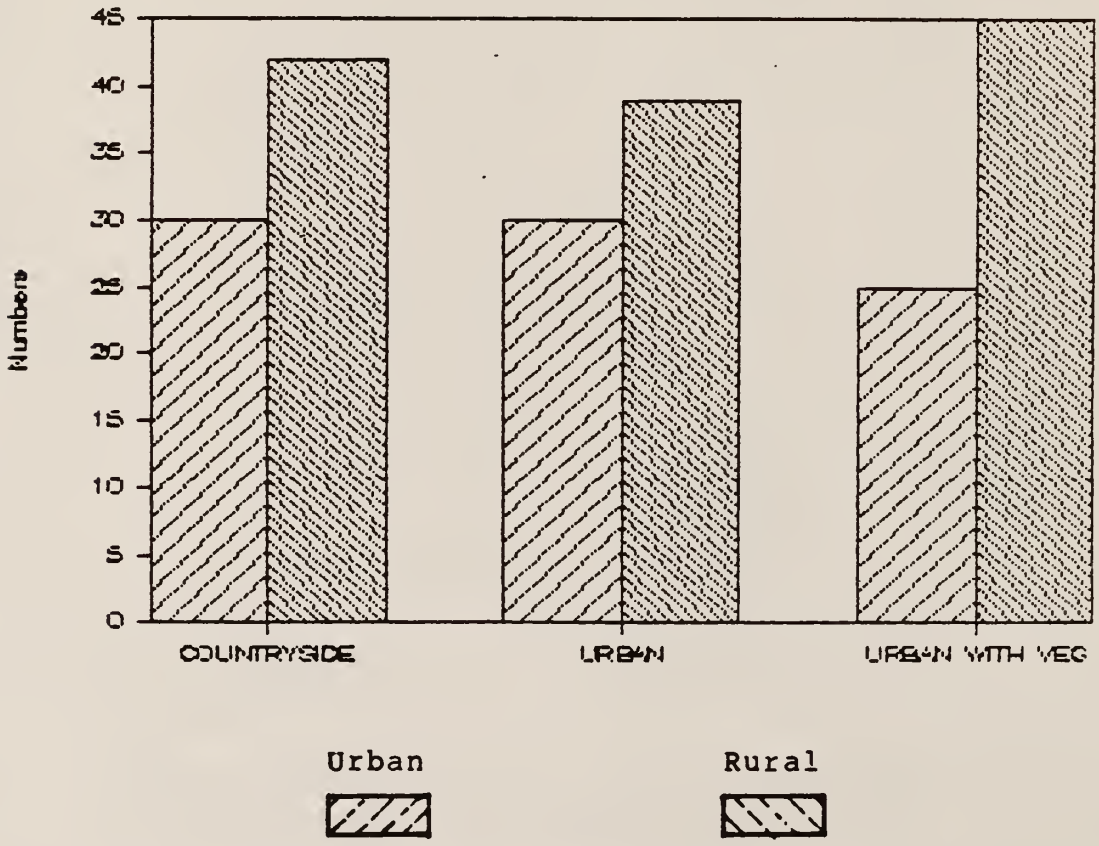


To reduce the number of groups further, they were also combined into two classifications: urban, combining urban with suburban (n = 85) and rural, combining small town with rural area (n = 126) (Table 4.8). These totals revealed that a predominance of participants had spent the majority of their lives in a rural setting. Figure 4.6 shows a graphic representation of the figures listed in Table 4.8.

Table 4.8: Groups by Urban and Rural Setting

Group	Urban	Rural
COUNTRYSIDE	30	42
URBAN WITHOUT VEGETATION	30	39
URBAN WITH VEGETATION	25	45
TOTAL	85	126

Figure 4.6: Groups by Urban and Rural Setting



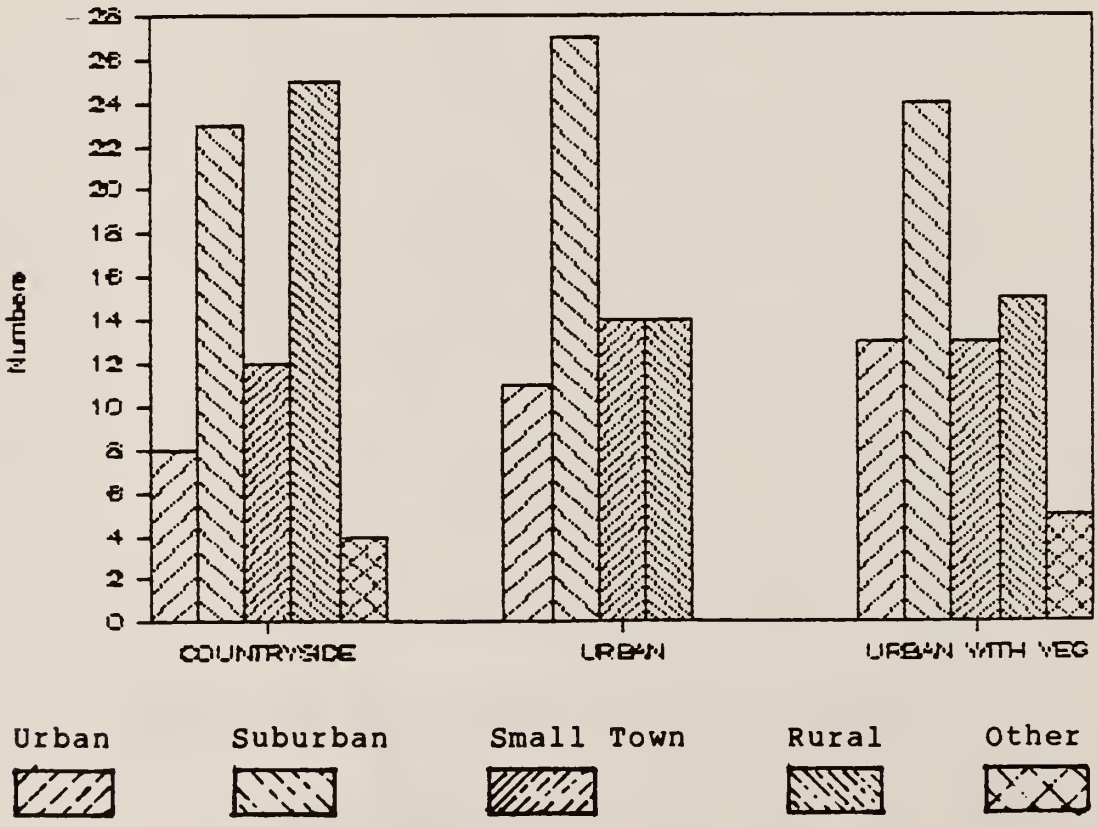
Analysis of the responses giving the participants' current preferred environmental setting revealed a definite preference for the suburban environment. Totals for preferred environment were urban (n = 32), suburban (n = 74), small town (n = 39), rural (n = 54) and other (n = 9). Choices for the "other category" were general and geographical in character, such as "in the mountains", "on the ocean", and "Florida". Individual group totals are shown in Table 4.9, graph in Figure 4.7.

Table 4.9: Group by Preferred Environment

Group	Urban	Suburb	Small Town	Rural	Other
C	8	23	12	25	4
U	11	27	14	14	Ø
V	13	24	13	15	5
TOTAL	32	74	39	54	9

C = COUNTRYSIDE
U = URBAN WITHOUT VEGETATION
V = URBAN WITH VEGETATION

Figure 4.7: Group by Preferred Environment

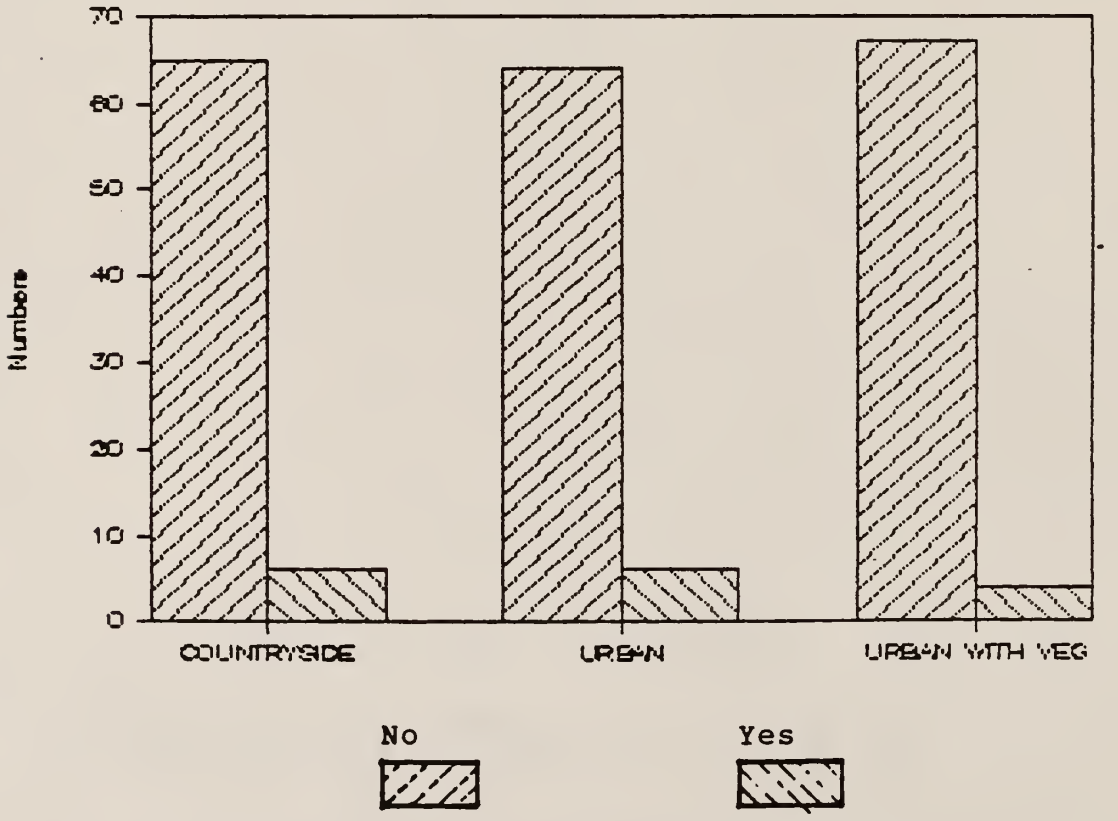


When analyzed, the data indicating personal history of stress related health problems showed a surprisingly low instance of problems. Participants who responded with a "no" answer, indicating no previous problems (n = 196) were much higher in number than those who answered "yes" (n = 16). Table 4.10 lists the totals by group. Graphic representation of these figures appears in Figure 4.8.

Table 4.10: Group by Personal Stress Related Health Problems

Group	No	Yes
COUNTRYSIDE	65	6
URBAN WITHOUT VEGETATION	64	6
URBAN WITH VEGETATION	67	4
TOTAL	196	16

Figure 4.8: Personal Stress Related Health Problems

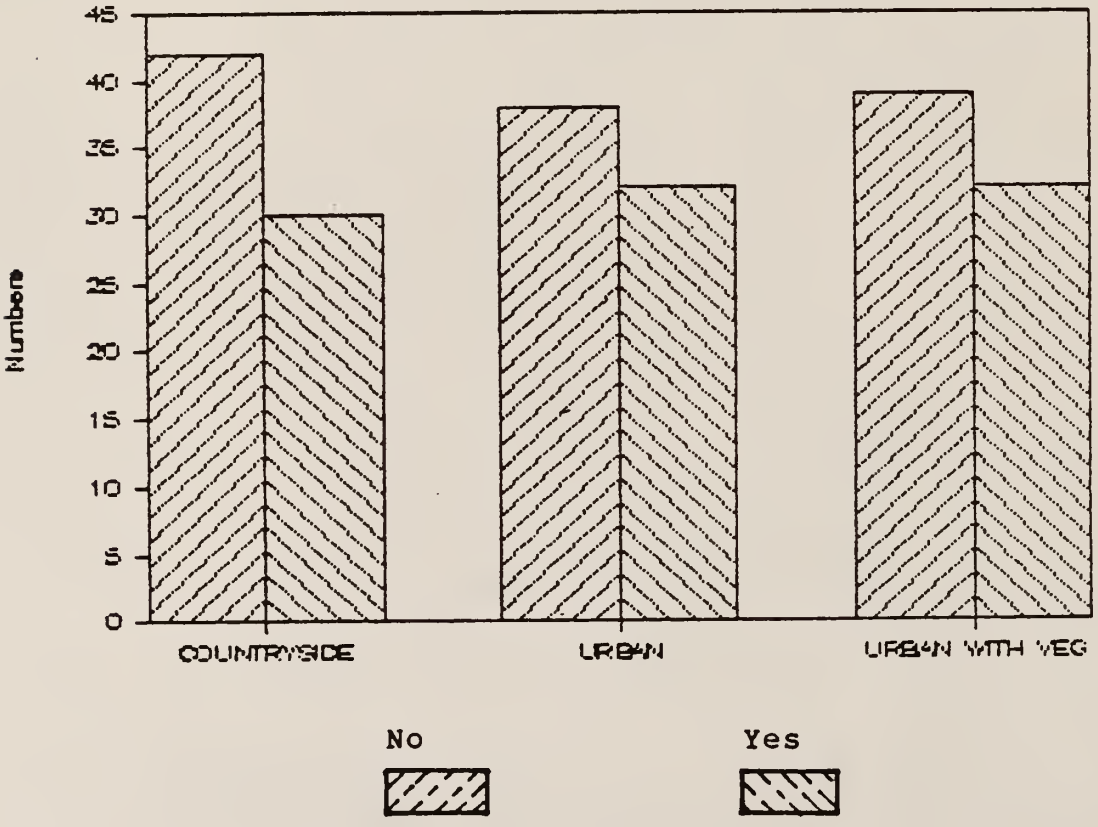


Responses to the question requesting information concerning family stress related health history revealed an increase in the number of positive responses. "Yes" answers totaled 119 while "no" responses totaled 94. Table 4.11 lists the totals by group. Figure 4.9 gives a graphic representation of these figures.

Table 4.11: Family Stress Related Health Problems

Group	No	Yes
COUNTRYSIDE	42	30
URBAN WITHOUT VEGETATION	38	32
URBAN WITH VEGETATION	39	32
TOTAL	119	94

Figure 4.9: Family Stress Related Health Problems



CHAPTER V

CONCLUSION

The intention of this study was to examine and test the common assumption that features inherent in the natural environment alleviate human stress. For the purpose of this study a certain feature of nature, vegetation, was investigated. Specifically, the psychological impact or effect of vegetation as it relates to the urban environment was explored. The previously mentioned assumption was studied through the measurement of the psychological effects people experience by viewing photographic slides of the landscape containing varying amounts of green vegetation.

The study focused on the following questions:

1. Are human stress levels influenced by the viewing of varying amounts of vegetation?

2. What effect, if any, does viewing vegetated, green COUNTRYSIDE landscape have on human stress levels?

3. How do the psychological effects of viewing COUNTRYSIDE landscape compare with those produced by viewing URBAN scenes WITHOUT VEGETATION?

4. How do the psychological effects of viewing COUNTRYSIDE landscape and the psychological effect of viewing URBAN scenes WITHOUT VEGETATION compare with those psychological effects produced by viewing URBAN scenes WITH VEGETATION included?

The original hypotheses for this study prior to data collection and analysis were that:

1. The stress levels of participants in groups that viewed slides containing vegetation, both COUNTRYSIDE and URBAN WITH VEGETATION, would be somewhat lowered;

2. The stress levels of participants in the group that viewed the larger amount of vegetation, COUNTRYSIDE, would decline more significantly than stress levels in the group that viewed the smaller amount of vegetation, URBAN WITH VEGETATION;

3. The stress levels of participants in the group that viewed the scenes of URBAN WITHOUT VEGETATION would remain the same or be elevated.

In this chapter data collected in this study are analyzed and interpreted in order to provide answers to the questions posed above. Results of the data analysis are examined as they relate to the hypotheses stated prior to analysis. Additional questions and ideas generated by this study are also discussed here.

COMPARISON OF RESULTS WITH RESEARCH HYPOTHESES

After the study data for response to the ZIPERS pre-test and post-test were collected and entered into the Harris system it was sorted and analyzed in search of trends toward the reduction or elevation of stress levels. The combination of affect responses which reflect the most stress reducing effects is comprised of lowered fear, anger, and sadness affect factors and raised positive affect and attentiveness factors. Conversely, the combination of affect responses which reflects the most stress inducing effects is comprised of raised fear, anger, and sadness affect factors and lowered positive affect and attentiveness affect factors (Figure 5.1).

Figure 5.1: Combinations of Affect Factors

Most Stress REDUCING Combination of Affect Responses	
Fear	Lowered
Anger	Lowered
Sadness	Lowered
Positive Affect	Raised
Attentiveness	Raised

Most Stress INDUCING Combination of Affect Responses	
Fear	Raised
Anger	Raised
Sadness	Raised
Positive Affect	Lowered
Attentiveness	Lowered

Results of the data analysis of the affect scores for responses before and after slide presentations as they relate to the predicted outcomes stated in the three hypotheses are presented as follows:

1. Countryside, and Urban with Vegetation Groups: Trends in Stress Reduction

2. Countryside, and Urban with Vegetation Groups: Degree of Stress Reduction

3. Urban Without Vegetation Group

1. COUNTRYSIDE, AND URBAN WITH VEGETATION GROUPS: TRENDS IN STRESS REDUCTION

When the differences between before and after assessment scores of the two groups which viewed scenes of landscape containing vegetation (countryside and urban with vegetation) were examined both groups were found to exhibit responses which indicated trends toward stress reduction. As was stated in the first hypothesis, the stress levels of both groups appeared to have been somewhat lowered after viewing the slides, thus confirming this hypothesis.

Table 5.1: Comparison of Affect Scores Before & After Slide Presentations: Vegetation Groups

Affect Factor	Mean Score Before	After	Result
COUNTRYSIDE GROUP			
Fear	1.15	1.04	Lowered
Anger	1.72	1.58	Lowered
Sadness	1.36	1.39	Raised
Positive Affect	3.10	3.22	Raised
Attentiveness	2.55	2.36	Lowered
URBAN WITH VEGETATION GROUP			
Fear	1.35	1.18	Lowered
Anger	1.60	1.45	Lowered
Sadness	1.49	1.44	Lowered
Positive Affect	3.27	3.30	Raised
Attentiveness	2.74	2.85	Raised

2. COUNTRYSIDE, AND URBAN WITH VEGETATION GROUPS: DEGREE OF STRESS REDUCTION

Further investigation revealed information which challenged the second hypothesis. The stress levels of the countryside groups did not decline more significantly than the stress levels of the urban with vegetation groups. In fact, in the countryside group two of the factors reflected some elevation in stress levels. The affect factor of sadness was raised and the affect factor

of attentiveness was lowered indicating an elevation of stress levels in both cases (Table 5.2).

Table 5.2: Comparison of Affect Scores Before and After Slide Presentations: Countryside and Urban With Vegetation Groups

Affect Factor	Mean Score Before	Mean Score After	P-Value	Result
COUNTRYSIDE GROUP				
Fear	1.15	1.04	0.0039 ***	Lowered
Anger	1.72	1.58	0.0903	Lowered
Sadness	1.36	1.39	0.6406	Raised *
Positive Affect	3.10	3.22	0.1454	Raised
Attentiveness	2.55	2.36	0.1366	Lowered *
URBAN WITH VEGETATION GROUP				
Fear	1.35	1.18	0.0039 ***	Lowered
Anger	1.60	1.45	0.0083 ***	Lowered
Sadness	1.49	1.44	0.5088	Lowered
Positive Affect	3.27	3.30	0.5817	Raised
Attentiveness	2.74	2.85	0.4894	Raised

*** = Significant Difference - Probability .05 or less
* = Indicates Elevation of Stress

In addition to these findings, statistically significant differences (Table 5.2) were found in only one of the affect factors, fear (0.0039), for the countryside group while significant differences were reported in two

of the five affect factors, fear (0.0039) and anger (0.0083), for the urban with vegetation group.

These findings indicate that stress levels were not further reduced as the amount of vegetation included in the scene was increased, as was anticipated, thus refuting this hypothesis. While the countryside group, which viewed scenes with the greatest amounts of vegetation, showed an elevation of stress levels in two out of the five affect factors, the urban with vegetation group, which viewed scenes with lesser amounts of vegetation, showed a reduction of stress levels in all five affect factors. These results suggest that characterisics of vegetation other than the varying amounts may have contributed to the elevation or reduction of the participants' stress levels.

3. URBAN WITHOUT VEGETATION GROUP

Analysis of the response scores of the group which viewed urban scenes without vegetation produced results that support the third hypothesis. Results showed an elevation of stress levels in four of the five affect factors (Table 5.3). The affect factors of anger and sadness were raised while the affect factors of positive affect and attentiveness were lowered indicating elevation

of stress. The score for the affect factor of fear was lowered, although not significally, indicating a slight reduction in stress. These findings offer considerable support for the third hypothesis which anticipated the stress levels for the urban without vegetation group would remain the same or be elevated following the slide presentations.

Table 5.3: Comparison of Affect Scores Before & After Slide Presentations: Urban Without Vegetation Group

Affect Factor	Mean Score Before	After	P-Value	Result
URBAN GROUP				
Fear	1.20	1.13	0.1989	Lowered *
Anger	1.58	1.61	0.6064	Raised
Sadness	1.50	1.63	0.2007	Raised
Positive Affect	3.13	2.65	0.0001 ***	Lowered
Attentiveness	2.83	2.66	0.1529	Lowered

*** = Significant Difference - Probability .05 or less
* = Indicates Reduction of Stress

Of particular note was the highly significant statistical difference (0.0001) which was found in the positive affect category of responses. Considering all four of the significant differences discovered in the entire data analysis this difference was definitely the

most dramatic. This finding strongly suggests that the viewing of slides containing urban scenes devoid of vegetation elicites human response which is very stressful.

SUMMARY OF RESULTS

An overview of the research findings reveals support for two of the three hypotheses originally put forth (Table 5.4).

As was anticipated, both groups which had viewed the slide presentations with vegetation included in the photographed scenes exhibited responses indicating a lowering of stress. However, the group which had viewed the presentation showing the greatest amount of vegetation, the countryside scenes, did not elicite responses that exhibited a greater reduction of stress than the group which viewed urban with vegetation. In fact, the group which had viewed urban with vegetation slides displayed a lowering of stress to a statistically significant degree in two of the five affect factors (fear = Ø.ØØ39, anger = Ø.ØØ83), while the group which had viewed the countryside displayed a statistically significant reduction of stress in only one of the affect factors, (fear = Ø.ØØ39).

Table 5.4: Composite Results

Affect Factor	Mean Score Before	After	P-Value	Result
COUNTRYSIDE GROUP				
Fear	1.15	1.04	0.0039 ***	Lowered
Anger	1.72	1.58	0.0903	Lowered
Sadness	1.36	1.39	0.6406	Raised
Positive Affect	3.10	3.22	0.1454	Raised
Attentiveness	2.55	2.36	0.1366	Lowered
URBAN WITH VEGETATION GROUP				
Fear	1.35	1.18	0.0039 ***	Lowered
Anger	1.60	1.45	0.0083 ***	Lowered
Sadness	1.49	1.44	0.5088	Lowered
Positive Affect	3.27	3.30	0.5817	Raised
Attentiveness	2.74	2.85	0.4894	Raised
URBAN GROUP				
Fear	1.20	1.13	0.1989	Lowered
Anger	1.58	1.61	0.6064	Raised
Sadness	1.50	1.63	0.2007	Raised
Positive Affect	3.13	2.65	0.0001 ***	Lowered
Attentiveness	2.83	2.66	0.1529	Lowered

*** = Significant Difference - Probability .05 or less

Analysis of the responses of the group which had viewed urban scenes without vegetation resulted in findings which support the third hypothesis. Stress

levels of the participants in this group did not remain the same but were elevated. An elevation of stress was found in four of the five affect factors. Only one factor showed any reduction of stress, slight at that (fear = Ø.1989). An outcome of this analysis of particular importance is that of the very significant lowering of the affect factor of positive affect (Ø.ØØØ1).

From this study one can confidently infer that:

1. The natural environmental element of vegetation plays a prominent role in the psychological well-being of humans.

2. The inclusion of vegetation in urban areas provides considerable psychological benefit to those who experience it.

3. To the contrary, the exclusion of vegetation in urban areas actually elicites negative psychological human responses, thereby creating stress.

4. Human psychological response is impacted considerably by the absence or presence of vegetation in the urban context.

5. The introduction of vegetation in the urban environment has a profoundly positive psychological impact upon those who experience that landscape.

RESEARCH IMPLICATIONS

The unexpected results of the analysis of responses for the group which viewed slides of urban scenes with vegetation prompts questioning. Why did the group which viewed slides of urban scenes which included vegetation exhibit a greater reduction in stress levels than the countryside group? If greater amounts of vegetation included in landscape scenes do not, in fact, lower stress levels what characteristics of vegetation, other than amount, or quantity, may contribute to stress reduction?

Answers to this question may be explored with reference to studies which are similar to the research reported here. Several landscape preference studies which examine human response to the introduction of "natural" elements into an urban context have used color slides, as were used in this study, as a substitute for actual landscape scenes (Kaplan, Kaplan, and Wendt 1972; Gallagher 1977; R. Kaplan 1979 a,b; Herzog, Kaplan, and Kaplan 1982). In all cases the "natural" element of vegetation was found to demonstrate significant positive influence on preference. In addition to this finding, it was determined that the presence of urban vegetation in the form of designed, well-maintained foliage, such as urban plazas and well-landscaped residential areas, was

highly preferred over the more "natural" scenes, such as vacant lots containing "scruffy" vegetation. Together with the findings of studies presented earlier in this thesis which suggest that preferred environments are less stressful than those which are not preferred, the results of these studies provide one answer to the question raised in this study. Considering these findings, it would stand to reason that participants who viewed the urban with vegetation slides would exhibit more significantly lowered levels of stress than those who viewed the "natural" countryside scenes.

A second question is raised by this study. What reasons can be given for the preference of well-maintained, orderly, placement of vegetation over the more "natural" urban vegetation? The first possible answer relates to our ancestoral perception of landscape. In ancient times the countryside and woodlands were basically foreboding, dangerous landscapes full of possible life-threatening surprises. Perhaps remnants of this psychological perspective persist. Talbot and Kaplan (1984) found that inner city residents preferred " ... well-maintained areas incorporating built features over the more untouched and densely wooded urban areas which

were often more associated with fears of physical danger" (p. 222).

Other potential answers to this question can be formulated with the help of information gleaned from the results of recent research which examines various sources of urban environmental stress. Human adaptation to stressors in the environment has been studied often. It has been shown that unpredictable and uncontrollable stressors cause more damage to the individual in the long run than do those stressors which can be anticipated and over which the individual has a comfortable degree of control (Glass and Singer 1972).

Several studies report that when an individual is confronted with a situation in which he/she is powerless to anticipate and affect the occurrence of an environmental stressor he/she responds with the psychologically stressful feeling of helplessness and futility (Janis 1958, Lazarus 1966). In this study the landscape scenes which were presented to the urban with vegetation group displayed a high degree of order and good landscape maintenance. Could it be that these slides, in contrast to the "natural" countryside scenes, were perceived as landscapes of predictable content over which

the individual would have more control thereby evoking a less stressful response?

Data analysis provided results which were most dramatic in the group which viewed urban scenes devoid of vegetation. The highly significant elevation of stress indicated by the lowering of the affect factor of positive affect suggests that the urban landscape without vegetation is psychologically stressful. These results, when compared with the results obtained from the group which viewed urban scenes containing vegetation, strongly support the argument for the inclusion of vegetation in urban design in terms of contributing substantially to the psychological well-being of the general public.

FUTURE RESEARCH

As was mentioned earlier, little research has been generated to date which examines the psychological effects of the inclusion of natural elements, such as vegetation, in urban design. However, a definite interest in this area appears to be emerging. Recent publications which discuss this topic encourage further investigation into this subject. Recognizing the need for research on the role of nature in the urban context, Rachel Kaplan (1986) makes the observation that " ... It is hard to believe

that behavioral scientists have devoted so little of their effort to a topic that is basic to the well-being of so many people ... But the need for action is clear ... natural elements must be given a more vital place in urban planning and design ... " (p. 155). Pitt, Soergell, and Zube (1979) call attention to the fact that there is currently a lack of " ... an overwhelming number of studies which address questions of the perceived value of trees" (p.210).

The importance of natural elements and of trees in particular has been emphasized in recent research. Gold (1977) insists that " ... the tree is the most dominant natural element in the urban landscape." Alexander, Ishikawa, and Silverstein (1977) emphatically state that " ... trees have a very deep and crucial meaning to human beings" (p. 798). What better reason for further investigation and study of the issue of man's possible psychological benefit through the inclusion of vegetation in the design of urban places?

Further investigation on the value of inclusion of vegetation in urban design could be very beneficial to the public as a whole. Vegetation, especially in the form of trees, undoubtedly improves the quality of life for those

who experience it as a part of their environment. Trees included in urban design furnish a natural means of climate and pollution control which makes life more pleasant physically as well as psychologically. People demonstrate an emotional and sentimental attachment to vegetation. To lose a tree is to lose a living thing, an old friend.

> " . . . People need contact with trees and plants and water. In some way, which is hard to express, people are able to be more whole in the presence of nature, are able to go deeper into themselves, and are somehow able to draw sustaining energy from the life of plants and trees and water" (Alexander, Ishikawa, and Silverstein 1977, p. 806).

"Urban nature" inspires people with "sustaining energy" and improves the lives of citizens with "spiritual sustenance". "Urban nature" should be valued for its beneficial contributions to the psychological well-being of those who are fortunate enough to enjoy and experience it. It is important that all urban design professionals give thoughtful consideration to the psychological impact a designed space may have on citizens. This is our moral and professional responsibility to the public.

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APPENDIX A

STATEMENT OF INFORMED CONSENT

TO BE READ AT THE BEGINNING OF THE EXPERIMENTAL SESSION

Good Afternoon:

My name is _____. I am a graduate student in the Department of Landscape Architecture here at K-State. I am here today to help with research which studies how people react to their environment.

There are no foreseeable risks or direct benefits for you in participating in this study. You may refuse to answer any of the questions that follow. Your participation is entirely voluntary and you may discontinue participation at any time. However, your voluntary participation is greatly appreciated.

The procedure we will follow today is very simple. I will ask each of you to fill out two questionnaires. The first is a simple 10 question form which will be given to you immediately before the slide presentation. After completing this questionnaire, I will show a short slide presentation. During this presentation you will not be asked to do anything except view the slides. After the slide presentation, I will ask you to fill out another simple 21 question form. The whole procedure should take only about 15 to 20 minutes.

PASS OUT QUESTIONNAIRES

Please fill out only the top questionnaire. Stop at the colored sheet. When you have completed questionnaire #1 please turn the questionnaire face down on your desk. You will be asked to turn to the remaining pages and complete them after the slide presentation.

READ THE INSTRUCTIONS

HAVE THE PARTICIPANTS COMPLETE THE FIRST QUESTIONNAIRE

It is very important that you PAY ATTENTION to the slides you are about to see. You are not asked to do anything else during the presentation.

SHOW SLIDES @ 9-10 SECOND INTERVALS

Please complete the last four pages of the questionnaire at this time. When you have completed the questionnaire you may hand it to me and be excused. Thank you for your time.

APPENDIX B

ZIPERS PRE-TEST

HONEYMAN
Landscape Comparison Study: Questionnaire #1
September 1986 - May 1987

Please respond to the following statements in terms of how much you are feeling certain things now, AT THIS VERY MOMENT. To indicate your answer, circle a number using the following scale:

1 = not at all
2 = slightly
3 = moderately so
4 = quite a bit
5 = very much

Please complete each item. Thank you very much for your help.

I FEEL FEARFUL	1	2	3	4	5
I FEEL SAD	1	2	3	4	5
I FEEL CAREFREE OR PLAYFUL	1	2	3	4	5
I FEEL ANGRY OR DEFIANT	1	2	3	4	5
FEEL AFFECTIONATE OR WARMHEARTED	1	2	3	4	5
I FEEL ELATED OR PLEASED	1	2	3	4	5
I FEEL LIKE ACTING FRIENDLY	1	2	3	4	5
I FEEL LIKE TELLING OFF SOMEONE	1	2	3	4	5
I FEEL ATTENTIVE OR CONCENTRATING	1	2	3	4	5
I FEEL LIKE GETTING OUT OF THIS SITUATION OR AVOIDING IT	1	2	3	4	5

APPENDIX B

ZIPERS POST-TEST

HONEYMAN
Landscape Comparison Study: Questionnaire #2
September 1986 - May 1987

Please respond to the following statements in terms of how much you are feeling certain things now, AT THIS VERY MOMENT. To indicate your answer, circle a number using the following scale:

1 = not at all
2 = slightly
3 = moderately so
4 = quite a bit
5 = very much

Please complete each item. Thank you very much for your help.

I FEEL FEARFUL	1	2	3	4	5
I FEEL SAD	1	2	3	4	5
I FEEL CAREFREE OR PLAYFUL	1	2	3	4	5
I FEEL ANGRY OR DEFIANT	1	2	3	4	5
FEEL AFFECTIONATE OR WARMHEARTED	1	2	3	4	5
I FEEL ELATED OR PLEASED	1	2	3	4	5
I FEEL LIKE ACTING FRIENDLY	1	2	3	4	5
I FEEL LIKE TELLING OFF SOMEONE	1	2	3	4	5
I FEEL ATTENTIVE OR CONCENTRATING	1	2	3	4	5
I FEEL LIKE GETTING OUT OF THIS SITUATION OR AVOIDING IT	1	2	3	4	5

APPENDIX C

EXAMPLES OF LANDSCAPE SCENES

Countryside Scenes

Countryside Scenes, Continued

Urban Without Vegetation Scenes

Lancelot's

MOVING
VIOLATIONS
PG13
Diamond
Connection

Urban With Vegetation Scenes

APPENDIX D

DEMOGRAPHIC QUESTIONNAIRE

Instructions: Please fill in the blank or put an X behind the appropriate choice.

1. Your age: _____ M _____ F _____

2. Your major or program of study: _____

3. Your academic classification: Freshman _____

Sophomore _____

Junior _____

Senior _____

Graduate _____

4. Please list the area or areas in which you have spent most of your life. (i.e. Wamego, Kansas - a small town of 3,500 people in northeastern Kansas / Wichita, Kansas - a city of 350,000 people in south central Kansas).

_____

5. Would you consider the setting in which you have spent most of your life to be:

Urban _____

Suburban _____

Small Town _____

Rural _____

Other; Please Explain: _____

_____

6. While growing up, how much time did you spend in urban areas?

A great deal _____

Quite a bit _____

Some _____

Almost none _____

7. In which of the following environments would you prefer to spend the majority of your time, if given a choice?

Urban _____

Suburban _____

Small town _____

Rural _____

Other; Please explain: _____

_____

8. Do you have a personal history of high blood pressure of other stress related health problems?

No _____

Yes _____ If you answered yes, please explain:

_____

9. Do any members of your family have a history of high blood pressure or other stress related health problems?

No _____

Yes _____ If you answered yes, please explain:

_____

10. What type of recreational activities do you enjoy the most? (For example: Jogging, hiking, shopping, reading, team sports)

_____

_____

_____

THANK YOU VERY MUCH FOR YOUR TIME AND EFFORT ON THIS QUESTIONNAIRE AND THIS RESEARCH PROJECT. The information it will provide will be very useful. If you should have any questions about your involvement or the results of this study please feel free to contact me. Again, my thanks.

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VEGETATION AND STRESS:
A COMPARISON STUDY OF VARYING AMOUNTS OF VEGETATION IN COUNTRYSIDE AND URBAN SCENES

by

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AN ABSTRACT OF A MASTER'S THESIS

submitted in partial fulfillment of

the requirements for the degree

MASTER OF LANDSCAPE ARCHITECTURE

College of Architecture and Design

KANSAS STATE UNIVERSITY
Manhattan, Kansas

1987

ABSTRACT

This study examines common assumption that exposure to features found in the natural environment alleviate stress. Investigation is accomplished through measuring the psychological effects produced by viewing varying amounts of green vegetation. Previous studies concerning nature in urban environments, therapeutic effects of vegetation, visual landscape preference, psychological benefits of nature and human stress are reported.

Research design involved showing colored slides to three groups of participants. Each group viewed slides of scenes with a particular content: 1) green, vegetated countryside; 2) urban without vegetation; and 3) urban with vegetation. The Zuckerman Inventory of Personal Reactions (ZIPERS) was administered before and after the slide presentations in order to measure any change in participants' stress levels. The results of this research revealed that individual's stress levels may be lowered after visual exposure to green vegetation.

Data analysis showed significant differences in pre-test and post-test stress levels in all three of the groups. The most significant difference was shown between the groups that viewed the urban scenes with vegetation and the urban scenes without vegetation. The post-test scores were significantly higher in terms of positive affect for the group that viewed the urban scenes with vegetation when compared to the groups that viewed the urban scenes without vegetation. From these results it appears that the introduction of green vegetation into the urban landscape may be of important psychological benefit.

Information reported here should be of interest to many professionals who are concerned with the issue of environmental stress: urban planners, horticulturists, architects, environmental and behavioral psychologists and landscape architects. Information of this type is of considerable value to urban designers who are interested in increasing a personal sensitivity toward their fellow citizens through an understanding of the psychological responses a design may elicit.